



# **AV-8B Integrated Earned Value Management System**

**Presented to  
College of Performance Measurement  
15th Annual Conference  
4 May 1999**

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# Brief Contents



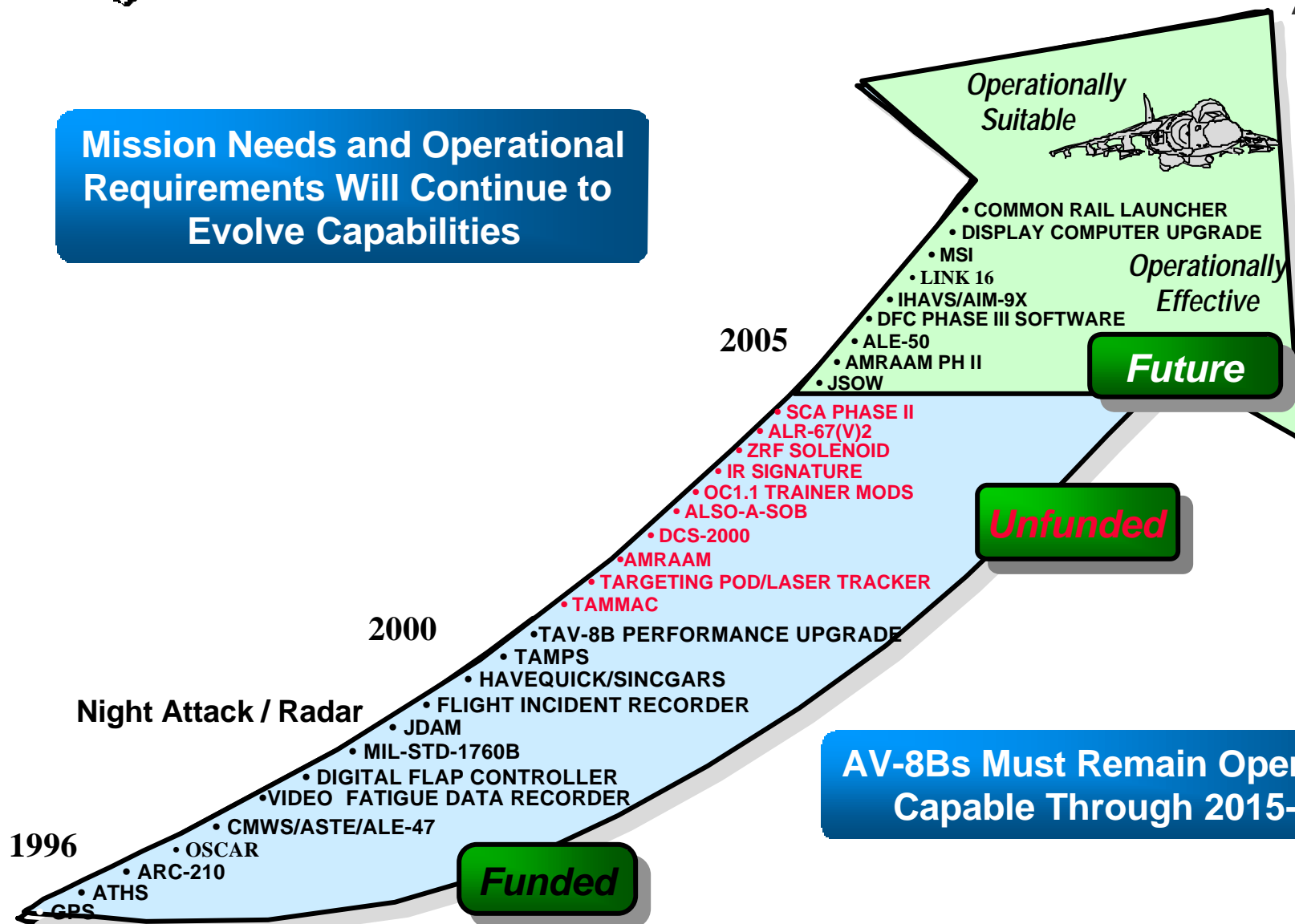
- 
- OSCAR Overview
  - NAWC-WD/Boeing EVMS Overview
  - Bringing it all together - The IBR
  - Conclusions



# AV-8B Operational Requirements



**Mission Needs and Operational Requirements Will Continue to Evolve Capabilities**



**AV-8Bs Must Remain Operationally Capable Through 2015-2020+**



# Avionics Upgrades for Legacy Aircraft



- Legacy aircraft such as the Harrier are forced to remain operational well beyond their projected service life
- Modernization of existing avionics
  - Practical means of extending Harrier's service life
  - Leverage commercial technologies



# Challenges of Avionics Modernization



## ■ Existing avionics computational capabilities

- ~~Existing architectures~~ are incompatible with available commercial technologies
- Limited computation throughput
- Input/output bandwidth limitations

## ■ Commercial technology advancements

- Military application of these technologies is hampered by acquisition process
- Legacy systems have tightly coupled hardware, software and support equipment which make upgrades difficult
- Commercial technology changes rapidly
  - Replacement of obsolete commercial parts may be a problem as they become obsolete much faster

# System Engineering Approach



- **Overall system engineering approach is key to using open architectures for legacy upgrades**
  - **Plan to incrementally upgrade avionics suite as time and funding allow**
  - **Engineer immediate upgrade requirements**
  - **Design to allow for changes in the future**



# What is an Open System Approach?



- Product performance and life cycle support drive engineering decisions
- Modular system design isolates the effect of component upgrades
- Use of commercial, widely used interface standards
- Buy rather than develop system components

# Open Systems Benefits

- ~~State-of-the art~~ systems
- Systems fielded faster
- Easier technology insertion
- Increased vendor competition
- Reduced life cycle costs
- Better performance





# Open Systems Risks

- Government has less control over outcomes -  
Government is a consumer vice a designer.
- Open systems products may not provide the optimum design for modules, components, subsystems, and short-term solutions
- Building an open system takes time for:
  - Market Analysis
  - Prototyping
  - Standards selection
- Open systems Interface Standards extensions may cause problems later on in the system life cycle

# Open System Core Avionics Requirement



- **Replace the existing AYK-14 Mission Computer configuration with PMA-209's Advanced Mission Computer**
- **Redesign and code the existing Mission Computer and Stores Management Computer functionality using:**
  - **Open Systems Architecture**
  - **Object-oriented Analysis and Design Methodology**
  - **C++ Programming Language**
  - **Commercial Software Development Tools**



# ***NAWC-WD/Boeing Integrated EVMS Overview***



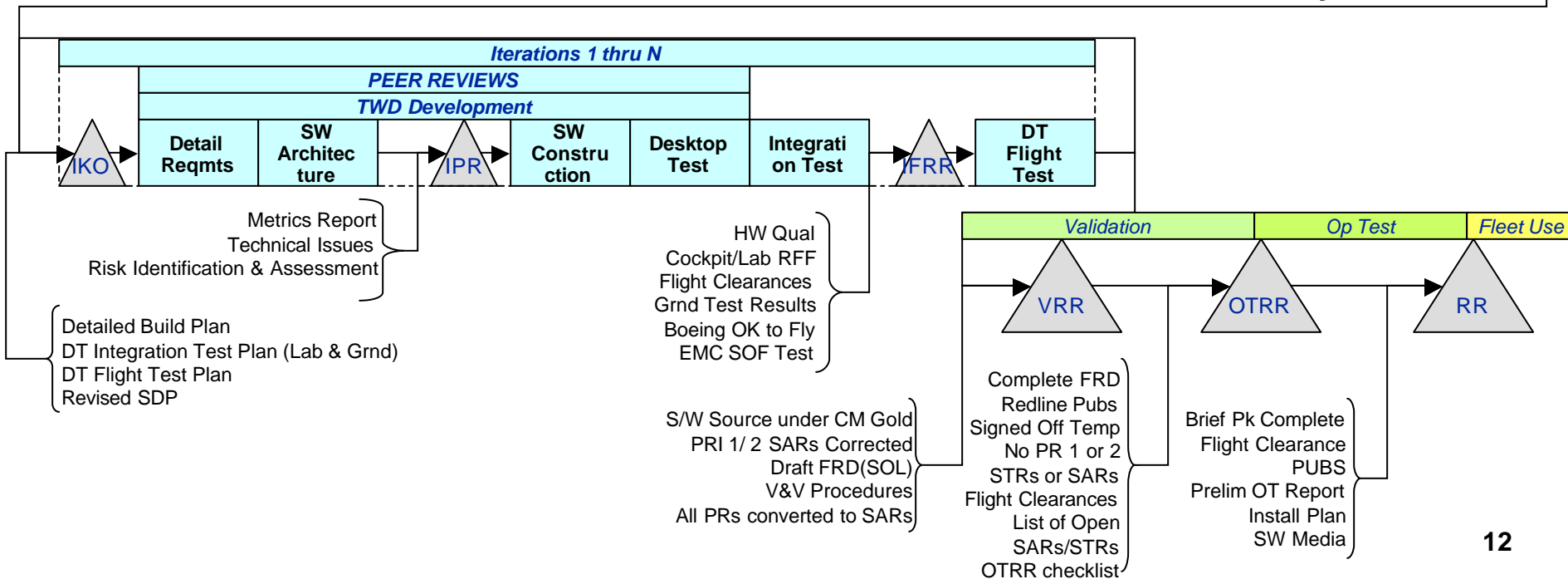
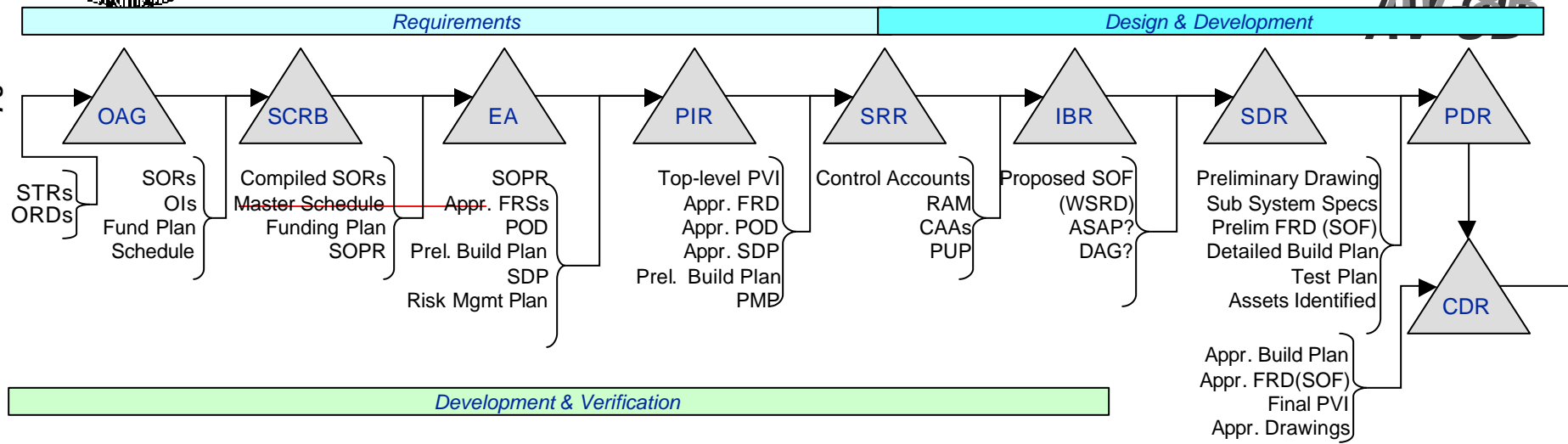
- **System Engineering Support Contract**
  - **Cost Plus Award Fee Contract**
  - **Contract specifies earned value and schedule data CDRLs**
    - Planning Data (Time phased budget data)
    - Status Data
    - VARs
- **Common WBS and WBS Dictionary**
- **BCR between organizations**



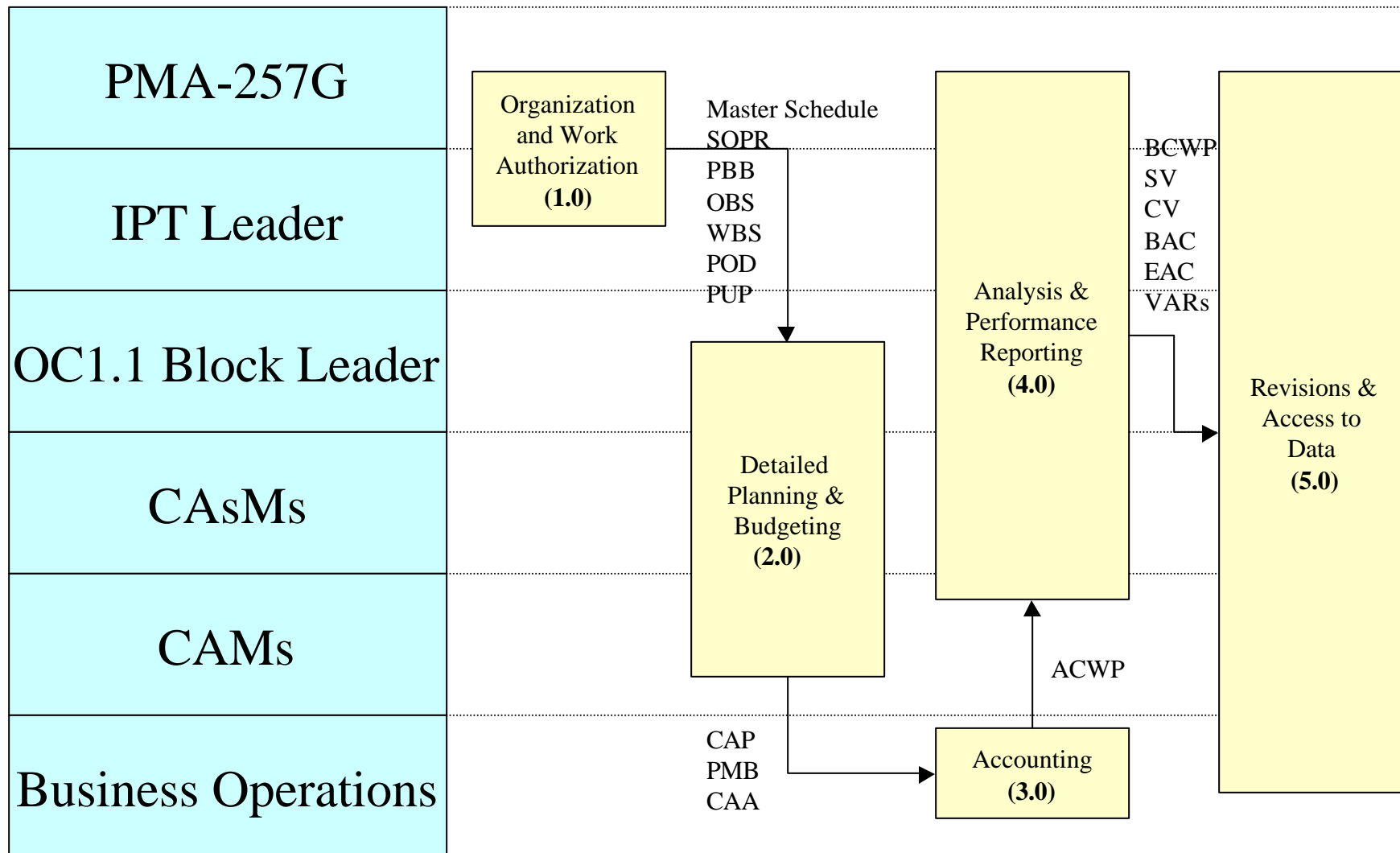
# Block Upgrade Milestone Schedule



Potential Block Upgrades

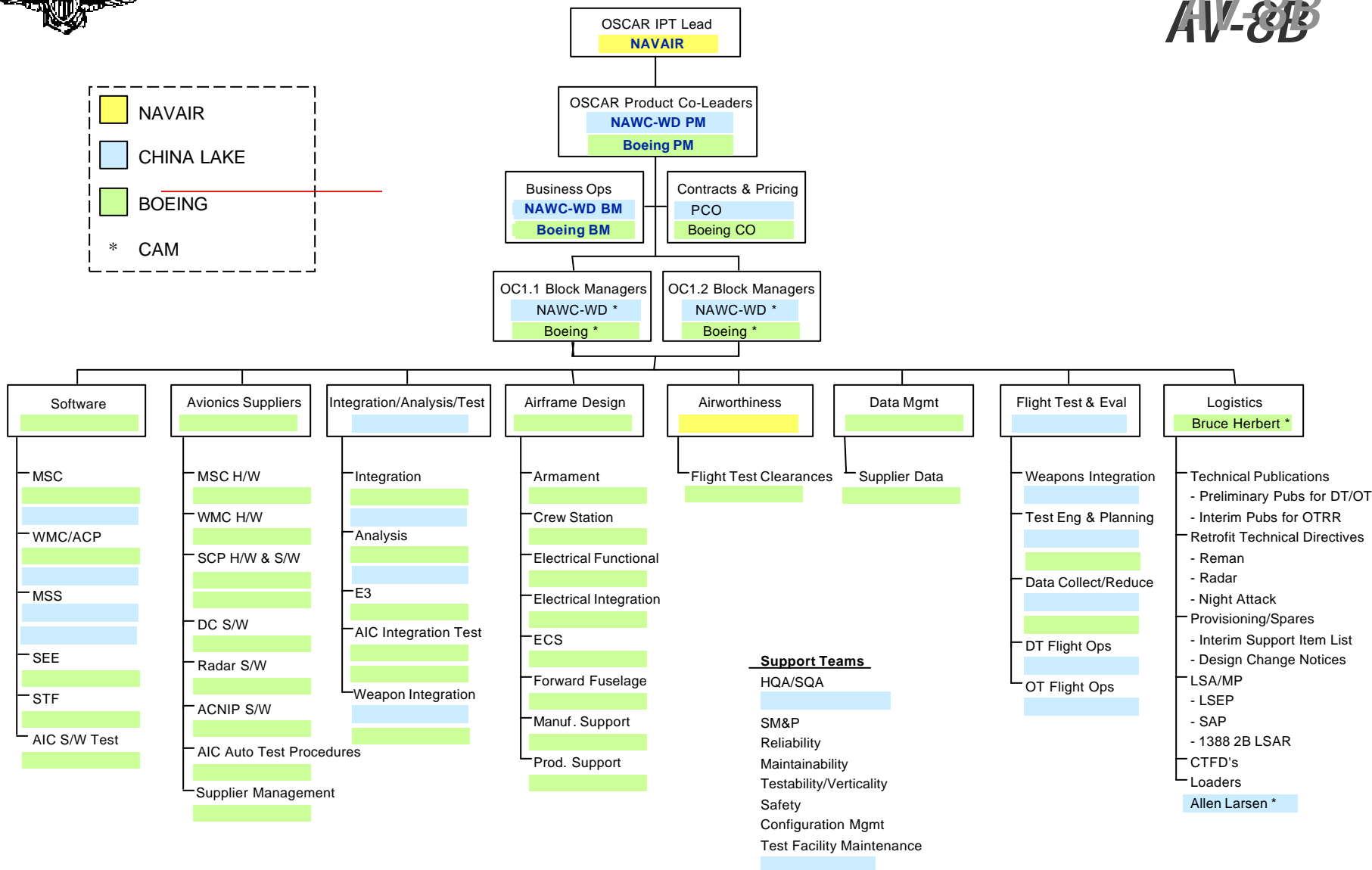
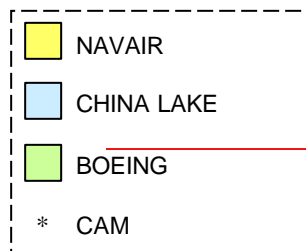


# EVMS Process Overview

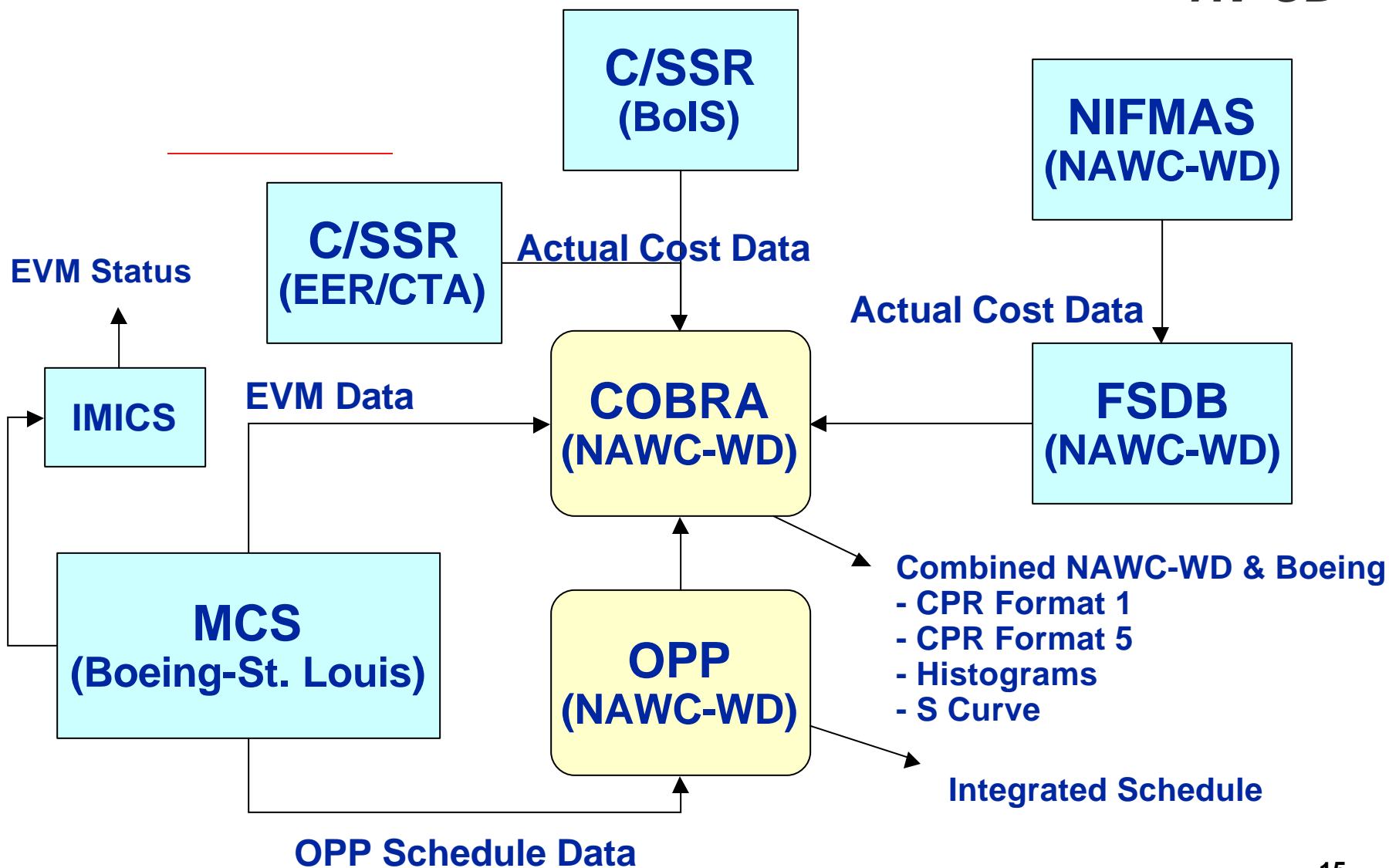




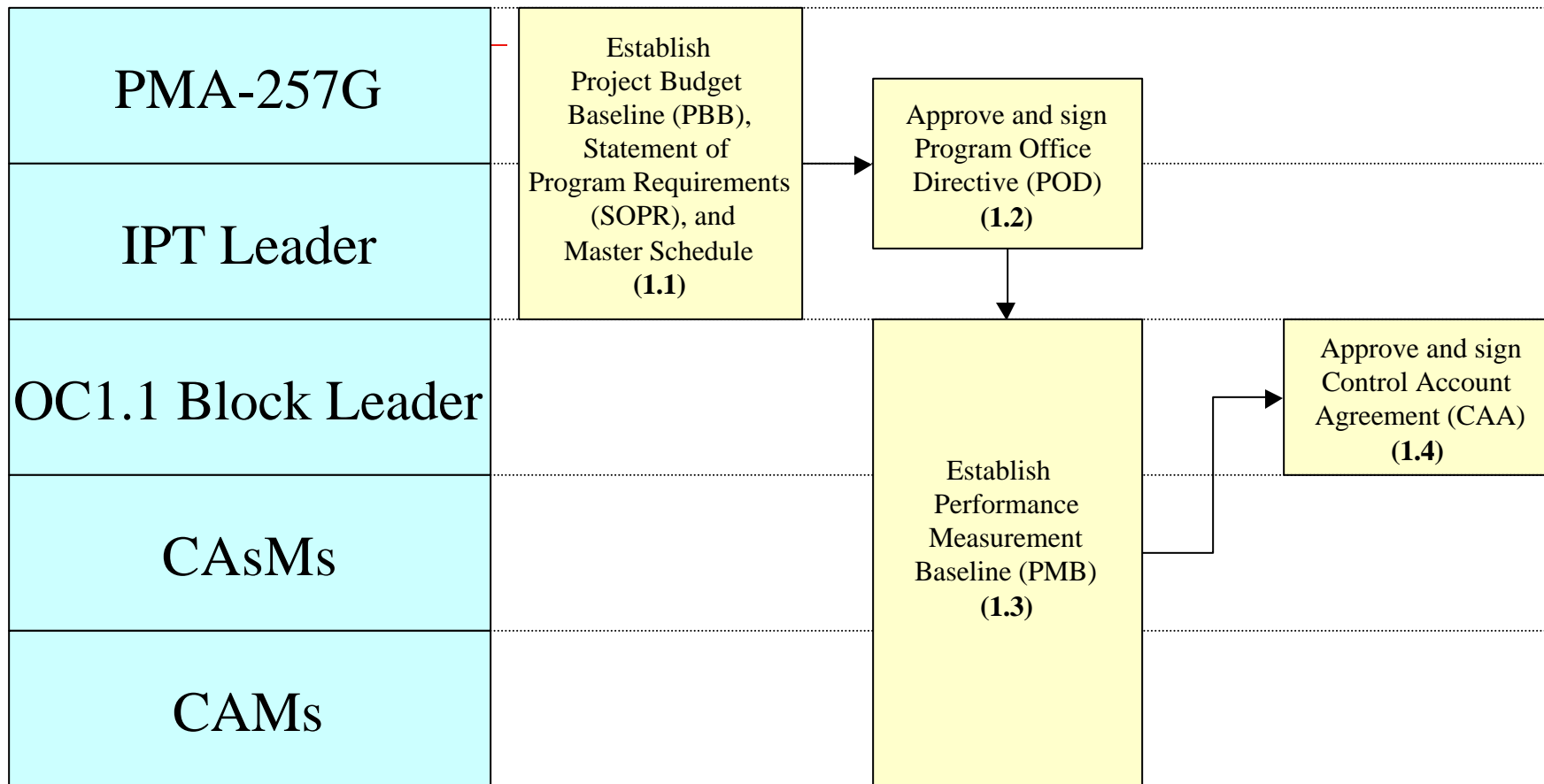
# IPT Organization



# EVMS Integration Overview



# Work Authorization Process





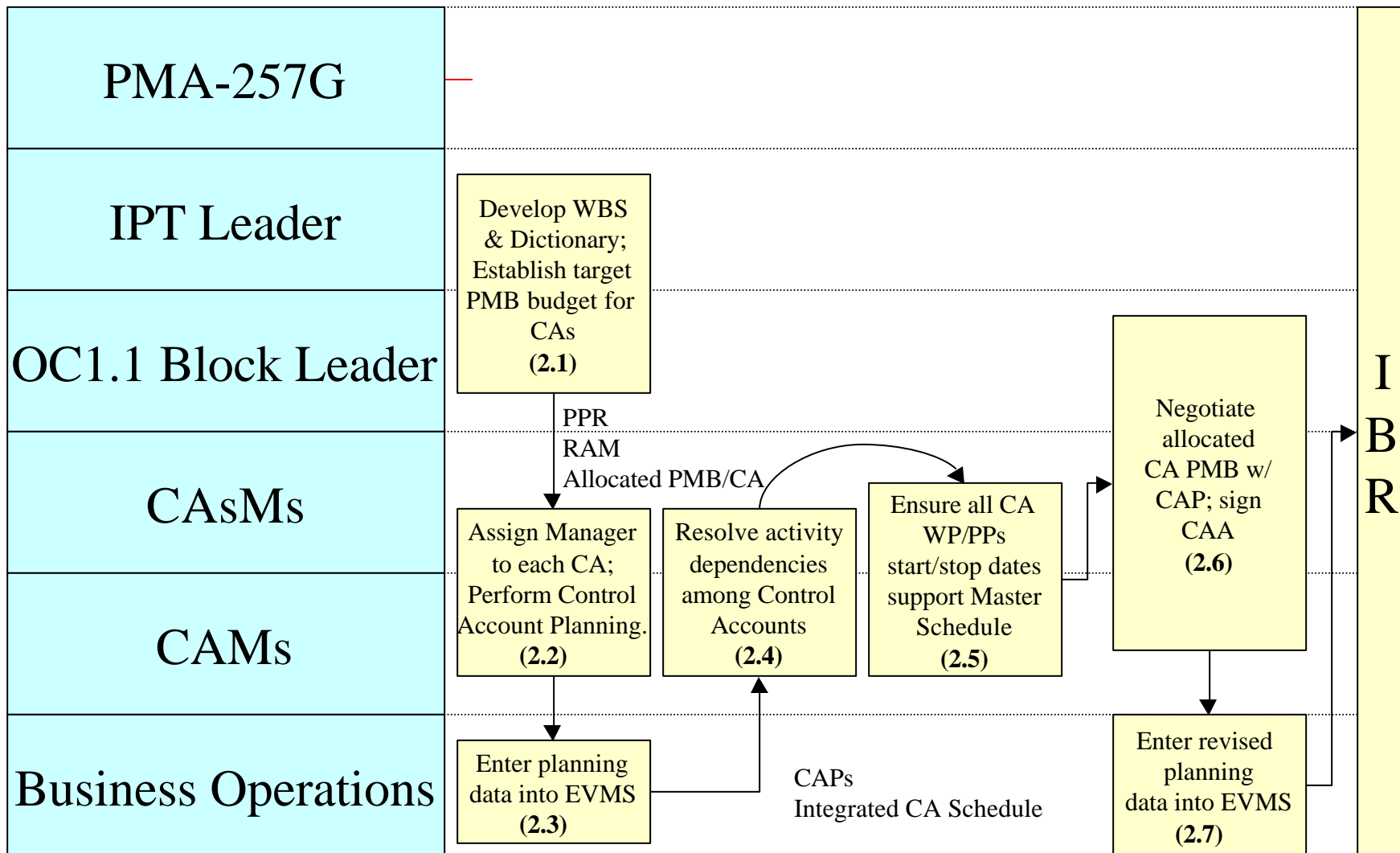


# Program Office Directive Contents

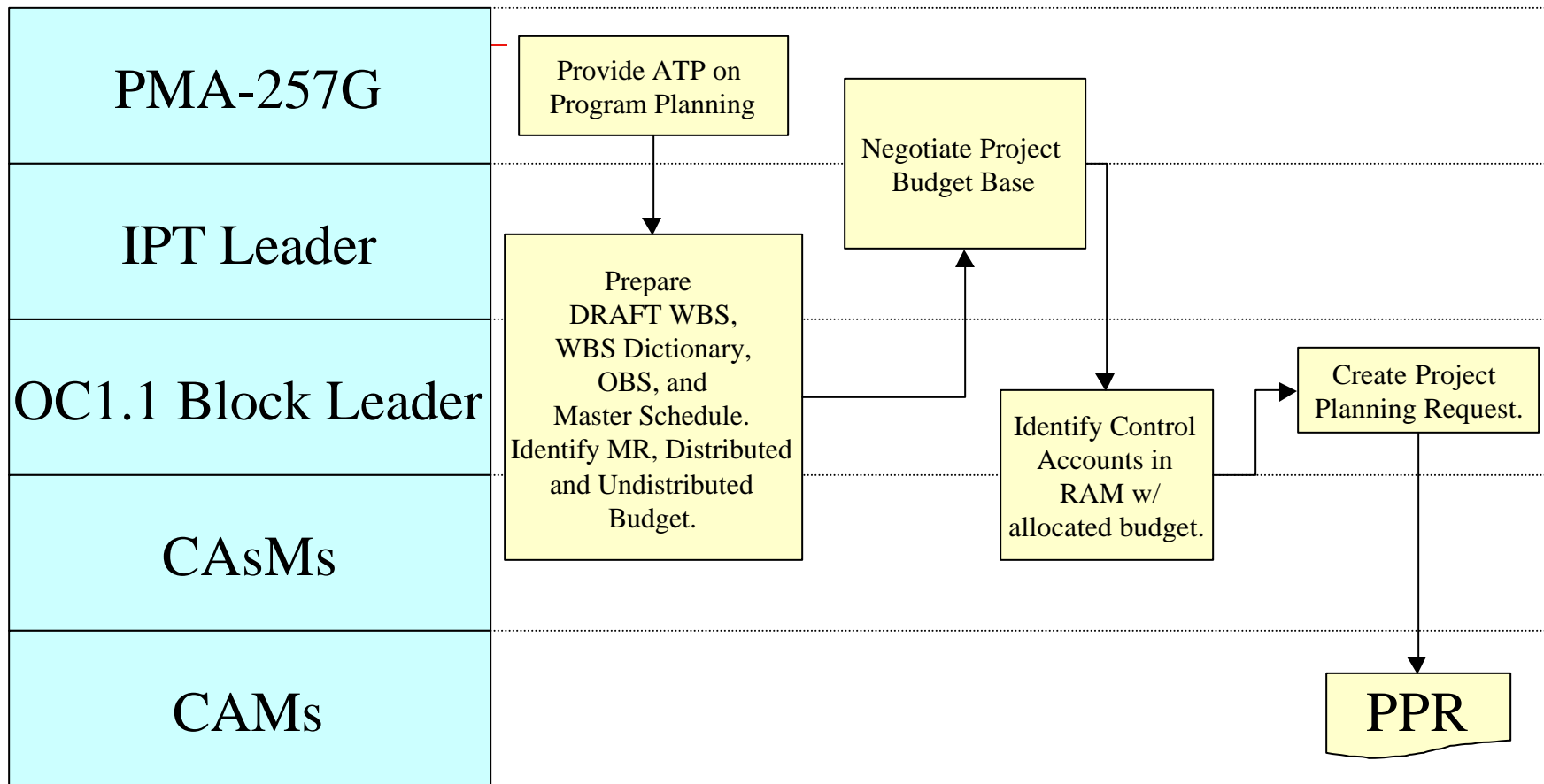


- Statement of Program Requirements (SOPR)
- Master Program Schedule
- Summary Program WBS Funding Plan
- Identification of Funding Sources
- Boeing Cost Plus Award Fee Contract Variance Analysis Threshold
  - \$100,000 or more and 10% of Sub-CLIN BAC

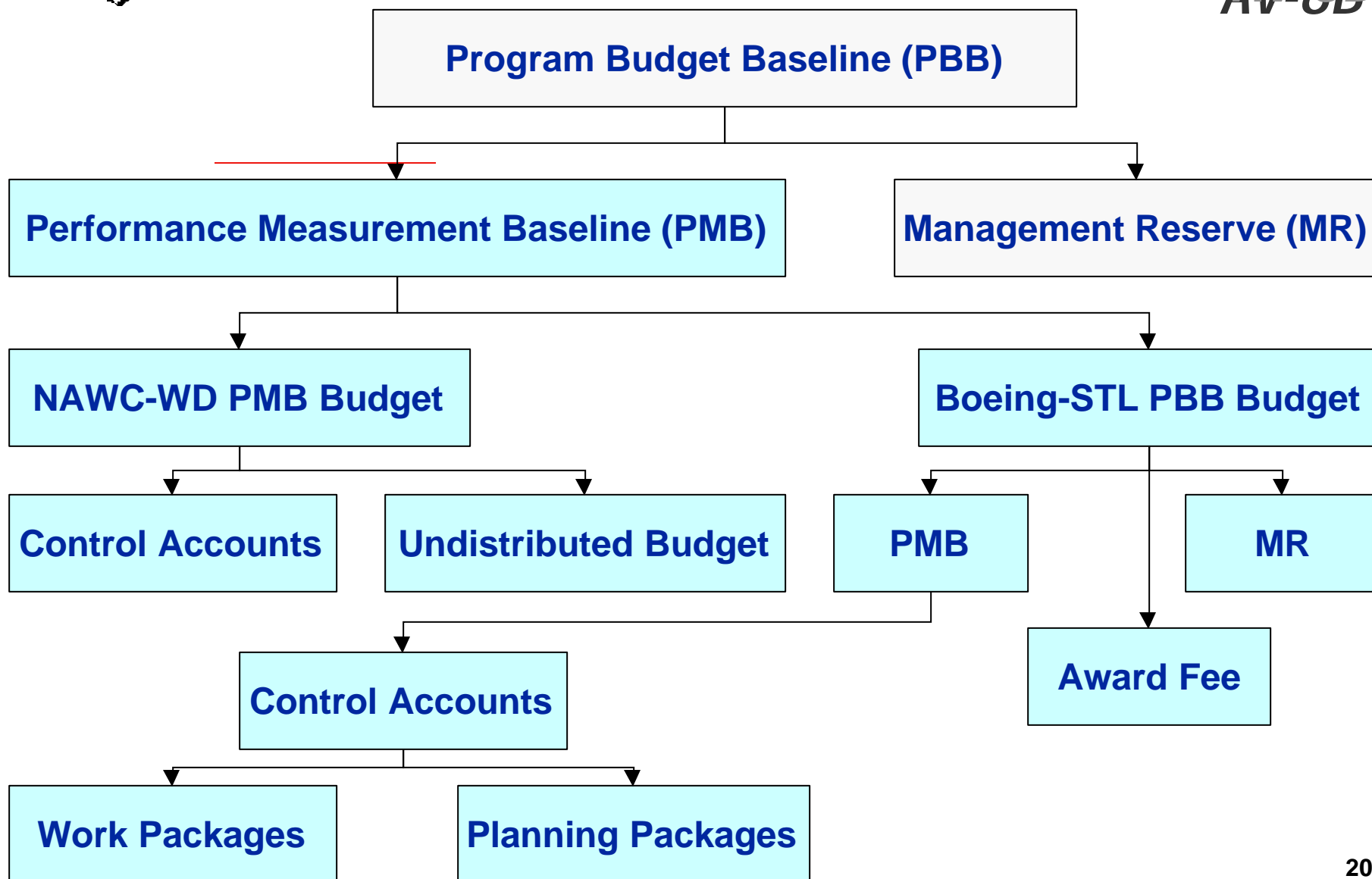
# Detailed Planning & Budgeting



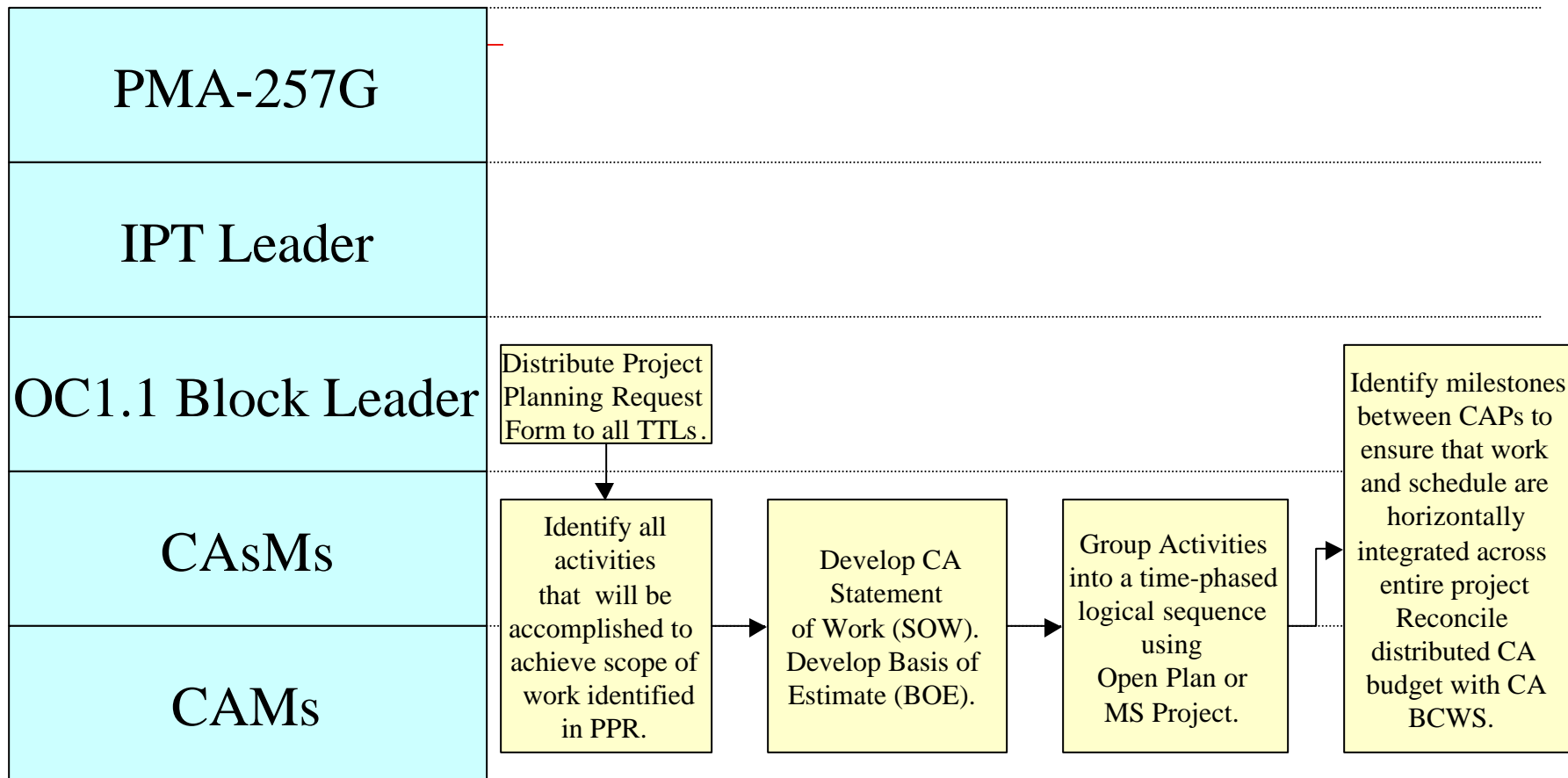
# Establish Project Budget Base



# OMNI OC1.1 PBB Distribution



# Develop Control Accounts



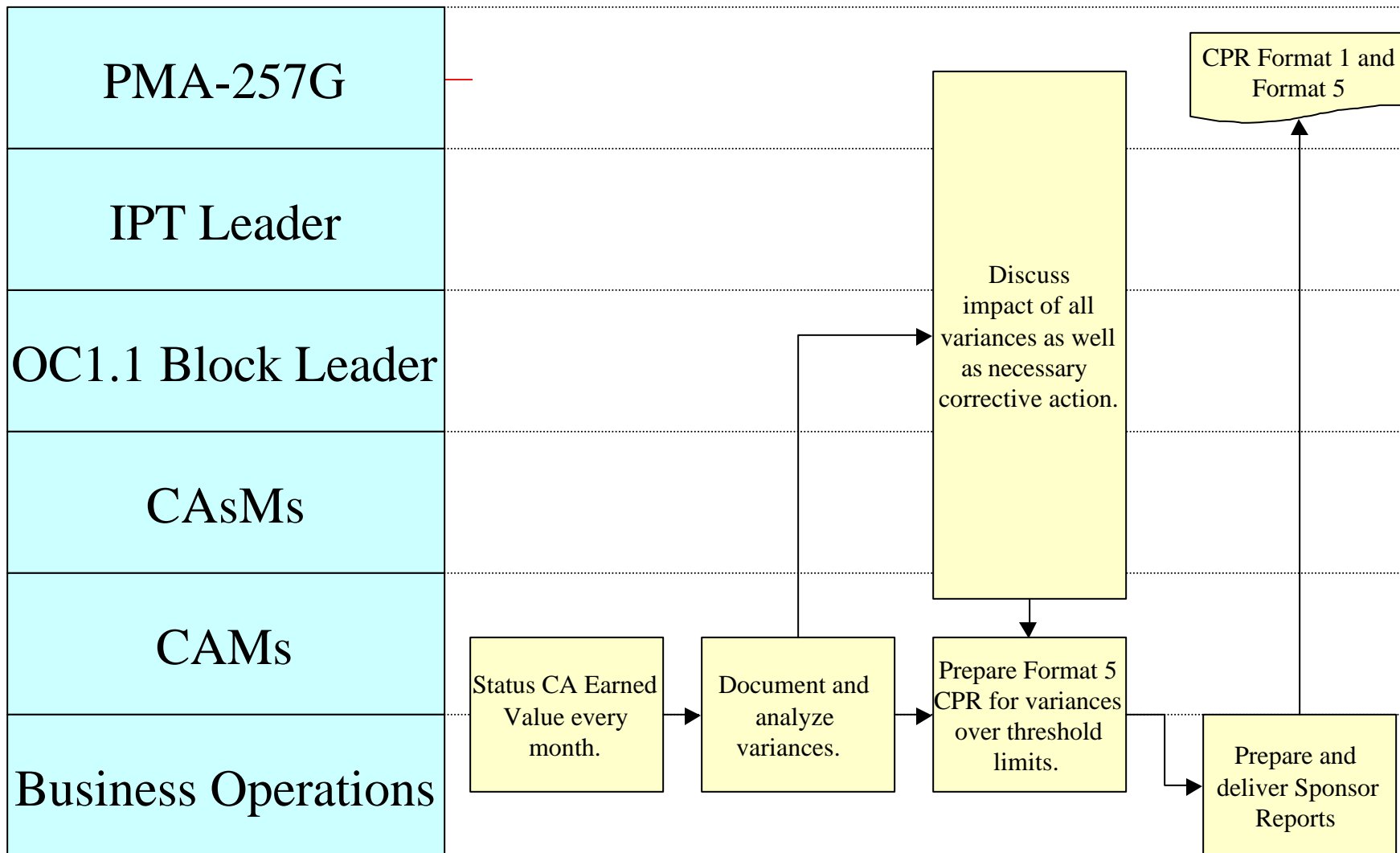


# Control Account Contents

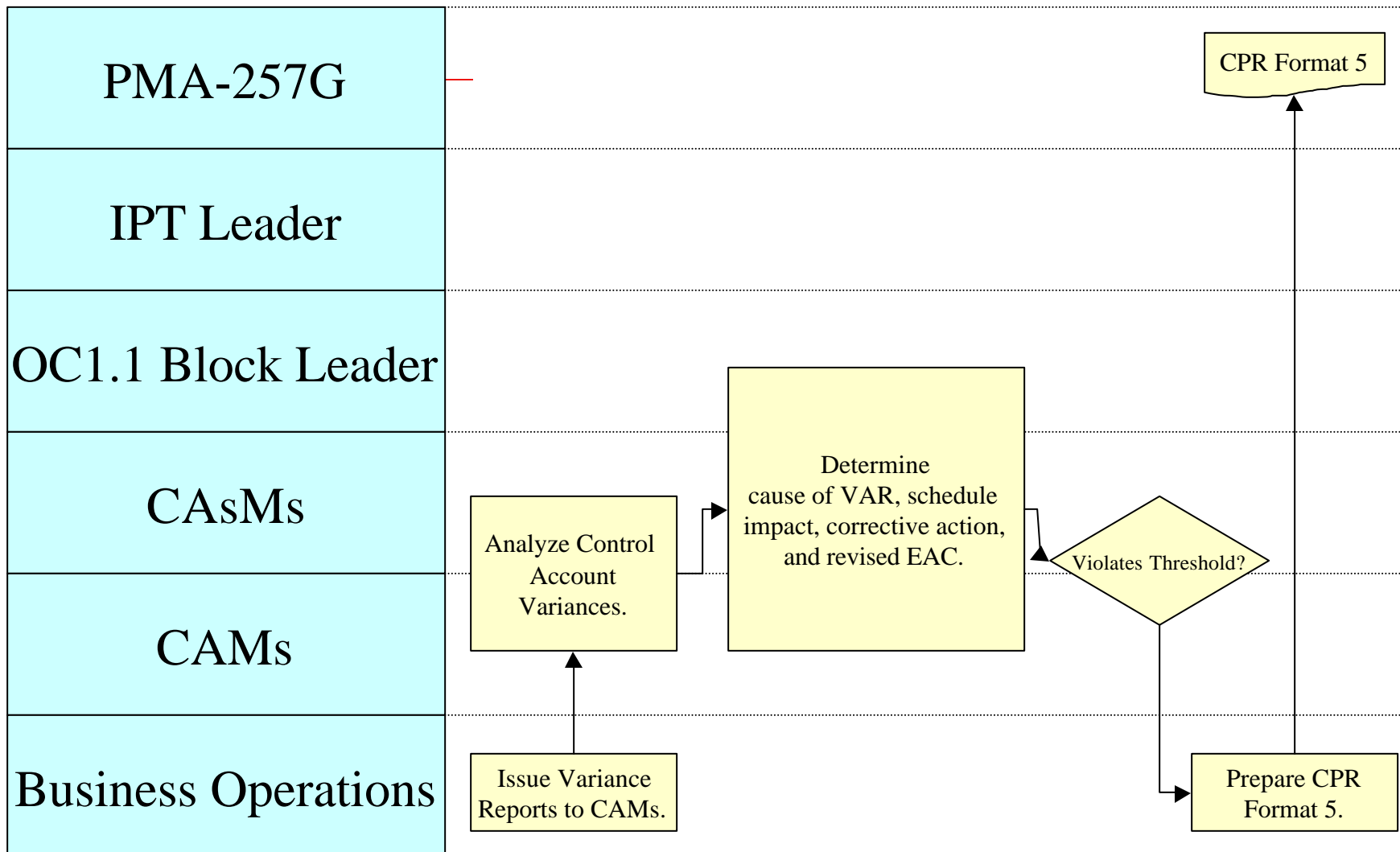


- Statement of Work
- JON
- Schedule
- Authorized Budget
- Time Phased Budget
- Earned Value Measurement Techniques
- Work Packages/Planning Packages
- Activity Schedule

# Project Performance Analysis



# Document and Analyze Variances





# Program Unique Publication



## ■ PUP contents describe:

- Tools and methods program will use to accomplish Earned Value Management
- Deviations from the minimum requirements stated in the NAVAIR EVM System Description Document Version 1.1
- Aspects of a program's EVMS that is not fully compliant with DOD 5000.2-R criteria
- Work Breakdown Structure coding instructions
- Reconciliation of accounting data (ACWP)



# **Bringing it all together**

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## **an**

# **Integrated Baseline Review (IBR)**

**April 19-21, 1999**



# OMNI OC1.1 IBR Expectations

- Provide the IPT with sufficient insight to ~~effectively~~ evaluate
  - ↗ the contents of the integrated EVMS
    - technical
    - budget
    - schedule
  - ↗ EVMS products
  - ↗ EVMS architecture
  - ↗ EVMS tools



# IBR Entrance Criteria

- EVMS used for 2-3 months
- EVMS has generated CPR for 2-3 months
- PUP approved and signed
- PBB established
- POD approved and signed
- CAM Notebooks created



# IBR Entrance Criteria Cont...



- Approved SOPR
- Approved Master Program Schedule
- Integrated NAWC-WD/Boeing WBS
- Integrated NAWC-WD/Boeing WBS Dictionary
- IBR Brief



## IBR Team

- Led by Program Office IPT Leader
- Team members included:
  - Program office technical specialists
  - NAVAIR EVM Specialists (supplemented by contractor support)
  - OSD - Mr. Van Kinny
  - DCMC - DPRO St. Louis
- IBR held at Boeing's facility in St. Louis  
(NAWC-WD CAMs came to Boeing)



# IBR Results

- ~~IBR Team~~ consisted of 14 Technical & EVM Analyst
- Interviewed 23 CAMs
  - ↗ 16 of 17 Boeing CAMs
  - ↗ 7 of 10 NAWC-WD CAMs
- Generated Concern Reports
- NAVAIR will track concerns to resolution
- Review was completed in a cooperative & productive environment



## Strengths

- First time Integrated EVMS has been accomplished between Contractor & Government Facility
- NAWC-WD & Boeing have established a baseline for performance measurement
- System interfaces functioning well
- Good CAM knowledge and management of tasks





## Strengths cont...

- ~~Earned Value~~ metrics for software development
- Management commitment to EVM
  - Boeing EVM experience has been beneficial
  - NAWC-WD has made significant progress
- Leadership - CAMs and support staff were open & candid
- “CAM bakes” demonstrate use of EV data



# Concerns

- Aggressive software productivity assumptions  
    ↗(Issue resolved)
- Establish and manage a critical path schedule
- Create a process to transfer scope & budget between NAWC-WD & Boeing
- Amount of LOE in combined Control Accounts may distort performance measurement



# IBR Summary



- IBR expectations achieved
- Performance measurement baseline captures cost, schedule and technical content of the project
- IBR review team identified pertinent issues that will improve the EVM system & data quality
- Project teams hard work, dedication, and commitment to the EVM implementation led to the success of the IBR



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# Conclusions



# EVM Implementation Conclusions



- Journey towards establishing EVMS was valuable
  - Discussions among Task Team Leaders
  - Discussions between Boeing and NAWC-WD
  - Recognized activity dependencies between all organizations
  - EVMS provides baseline for budget, scope of work and schedule
  - Tool to manage requirements changes
- EVMS provided a means for a cultural change in engineering management at AV-8B



# EVM Implementation Conclusions Cont...



- ~~Tools and~~ Boeing interface has worked
- Provides process for meaningful dialogue between product team and program team
- EVMS requires a lot of education for all team members
- Need to assess workload for EVMS administration overhead



# Conclusions



- EVM has provided significant improvement in visibility of budget and work scope
- The IBR is a critical part of preparing to execute a program
- Program office has a powerful tool to focus management attention